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Basis of Recommended Remediation Approach for Sites Impacted by Vapor Intrusion of TCE

Executive Summary:
Region 6 EPA RCRA and Superfund programs use the following table to address remediation at vapor intrusion sites. The low priority is the 10^{-6} risk inhalation screening value. The first priority is based upon protecting effects on the central nervous system.

Table 1. Remediation Prioritization for TCE

Indoor Air Concentration ug/m3	**Priority**
>10	First
5-10	High
1.2-5	Site-Specific
<1.2	Low

Background:
In existing guidance, OSWER recommends a hierarchy of toxicological sources that Regional risk assessors and managers should consider for site-specific risk assessments. OSWER directive 9285.7-53 describes this approach in more detail and can be found at http://www.epa.gov/oswer/riskassessment/pdf/hhmemo.pdf.

Region 6 EPA RCRA and Superfund programs use the California Environmental Protection Agency's (Cal EPA's) inhalation unit risk value of 2.0E-06 ($ug/m^{3)-1}$ for site-specific risk assessments involving the inhalation pathway and TCE. The Cal EPA IUR is derived from the geometric mean of the unit risks from four inhalation studies on mice and includes liver cancers, lung cancers, and lymphoma endpoints.

Vapor Intrusion Recommendations:
The Cal EPA IUR can be used to assess human health cancer risk from TCE through the VI pathway in order to develop a remediation goal for the inhalation of TCE. Using the latest equations for addressing risks due to inhalation, the 10^{-6} value is 1.2 ug/m^3. For remediation decisions, EPA usually considers the risk range of 10^{-4} to 10^{-6} and additional factors such as ARARs under CERCLA. In the case of TCE, the New York State Department of Health did a current review of the literature and found that the level to protect against non-carcinogenic effects is around 10 ug/m^3. Therefore, our recommended range for TCE remediation is 1.2 ug/m^3-10 ug/m^3. This remediation range can be interpreted to mean that any indoor air concentration above 10 ug/m^3 due to vapor intrusion needs mitigation/remediation promptly. Any indoor air concentration due to vapor intrusion below 1.2 ug/m^3 can be considered as a low priority. Region 6, relying

heavily upon the assessment done by the NYSDOH, has also determined that other remediation range priorities are warranted. Indoor air concentrations due to vapor intrusion between 5ug/m3 and 10ug/m3 should also be remediated/mitigated but take second priority to those indoor air concentrations above 10 ug/m^3. Indoor air concentrations between 1.2 ug/m^3 and 5 ug/m^3 may also need remediation/mitigation. Factors to consider when making that determination should include an evaluation of the following: 1) robustness of the data, 2) cost of mitigation versus seasonal monitoring, 3) whether or not groundwater contamination is controlled and concentrations are declining, 4) the presence of susceptible populations at residence including young children and the elderly, 5) the presence of other chemicals from vapor intrusion, and 6) other factors affecting vapor migration into building. It is envisioned that mitigation or monitoring will take place at residences where indoor air concentration is between 1.2 ug/m^3 and 5 ug/m^3 unless groundwater concentrations are declining and there are no susceptible populations currently at affected residence. As long as there is source present, there is the potential for vapor intrusion. The below table summarizes the remediation priority.

Table 1. Remediation Prioritization for TCE

Indoor Air Concentration ug/m3	**Priority**
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In determining indoor air concentrations for TCE, predictive lines of evidence should not be used, but actual measurements of indoor air TCE concentrations should be taken. Given the uncertainties with modeling and other measurements in predicting indoor air concentrations and the fact that background levels of TCE have been declining and are below 1 ug/m3, there is no reason to not conduct indoor air sampling for TCE to determine whether remediation is necessary or not. Crawlspace concentrations are considered to be the same as indoor air for purposes of this remediation guidance.

However, where indoor air measurements are not possible since no building currently exists, the potential for vapor intrusion should be considered. Where buildings are to be placed above existing contaminated soil and/or groundwater, engineering controls to mitigate for the potential of vapor intrusion should be considered before new buildings are constructed.